APPENDIX A to CW-25-17

City of Burlington
Energy and Greenhouse Gas Emissions
2016 Progress Report
for
Community & City Operations

City of Burlington | 426 Brant Street | Burlington | Ontario | L7R 4Z6

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1. Introduction

This report provides a progress update for the City of Burlington's Corporate Energy Management Plan as well as the Community Energy Plan.

The Corporate Energy Management Plan was endorsed by council in 2013, providing direction on improving the energy efficiency of city operations and reducing greenhouse gas emissions.

The Community Energy Plan was endorsed by council in 2014 with a vision to achieve a community that is efficient and economically viable in how it uses energy to reduce its reliance on the use of energy, reduce its carbon footprint, and improve local energy security.

This report provides information on:

- energy and water consumption for city facilities
- greenhouse gas emissions for city operations
- community wide energy consumption and
- community greenhouse gas emissions.

Energy data for city operations is based on billing information and is tracked through an on-line energy tracking system. Community energy data is provided Burlington Hydro (electricity) and Union Gas (natural gas). Data for transportation energy is based on the amount of fuel purchased in Burlington over in a given year and is purchased from a private company.

Reducing energy has the co-benefit of mitigating greenhouse gas emissions, lessening the impact on climate change. The city is a member of the Partners for Climate Protection (PCP) program, a joint partnership between the Federation of Canadian Municipalities (FCM) and ICLEI - Local Governments for Sustainability. The PCP program was developed to help municipalities reduce greenhouse gas emissions.

The PCP program consists of five milestones which participating municipalities must meet to reach completion. Burlington achieved the final milestones (4 and 5) in 2017.

Milestone 1: Create a greenhouse gas emissions inventory and forecast
Milestone 2: Set an emissions reduction target
Milestone 3: Develop a local action plan
Milestone 4: Implement the local action plan or a set of activities
Milestone 5: Monitor progress and report results.

The following is a timeline of the city's actions to meet milestones 1 to 5:

2005	First greenhouse gas emissions inventory (community & corporate) and forecast is complete (milestone 1)

2007	An emissions reduction target is established for corporate operations (milestone 2)
2013	Council endorses the corporate Energy Management Plan (milestone 3)
2014	Council endorses the Community Energy Plan (milestone 3)
2014	Council endorses a community wide emissions reduction target (milestone 2)
2017	Implementation of energy plans with monitoring and annual reports (milestones 4 and 5).

2. Implementing the Corporate Energy Management Plan

The city's Energy Coordinator has been reporting annually on the progress of the Corporate Energy Management Plan[1] (CEMP) since council endorsed it in 2013. Internal stakeholders include:

- Manager of Fleet – Roads and Parks Maintenance (liaison for Parks Bldgs)
- Manager – Parks & Recreation
- Manager – Transit
- Senior Buyer – Purchasing
- Financial Analyst – Finance Dept.
- Deputy Chief – Fire
- Manager of Facility Assets – Capital Works
- Coordinator of Asset Management – Capital Works
- Senior Sustainability Coordinator – Capital Works
- Coordinator, Project Management - Energy – Capital Works

External stakeholders that provide key support for the implementation of the CEMP include:

- Burlington Hydro
- Union Gas

The plan has a five year time horizon for the implementation of actions. For each action in the plan, a timeline for implementation is provided.

2.1 Status of Corporate Energy Management Actions:

As noted earlier, staff report annually to council on the energy management program. The following is an update on the most recent actions.

Municipal Facility Energy Management

- Facility Audits: were completed for the major city buildings prior to the completion of the CEMP.
- Energy Tracking: A new corporate energy tracking system was implemented in 2016 to track, monitor and report on energy performance of city owned buildings, including electricity, natural gas and water.
- Corporate Building Automation System (BAS): was implemented in 2011. Additional information has been added to the system through HVAC and system upgrades to provide the operators more detailed system information and alarms. A regular training program is being developed for operations staff in 2017.
- Arena DeOx Systems: installed as a pilot at Central Arena where the system removes oxygen during ice making, resulting in reduced refrigeration costs,

[1] http://www.burlington.ca/en/live-and-play/Corporate-Energy-Management.asp

natural gas and electricity consumption. It also reduces labour costs. The system saves energy by not requiring water for ice surfacing to be heated, reducing the cooling load on the refrigeration plant. An added benefit is ice that is harder, faster and more resilient to cutting. As part of the Canada 150 Funding, three of these systems are being installed at Appleby Ice Centre and Mainway Recreation centre.

- LED Lighting and Lighting Control Retrofit Projects: this is an ongoing project to upgrade indoor and exterior lights on buildings to enhance lighting levels and achieve greater energy savings using LED technologies. Projects in 2016-17 include The Waterfront Centre Exterior lighting, areas in Appleby Ice Centre, Tansley Woods Community Centre and a retrofit of the rink lighting at Mainway Recreation Centre is currently in design.
- Recommissioning of Buildings and Systems: Over time facilities drift from their design parameters from the addition of new building system, operator adjustment to suit certain conditions as well as degradation of the existing systems over time. Recommissioning is a process of working through building systems to ensure that they are performing as they were designed as well as adjusting systems to suit the occupants while keeping energy use in mind. A recommissioning pilot project was recently completed at Fire Station 8 and several low cost improvements to systems were made that should drastically reduce energy use in the facility. Measurement and verification activities will be carried out in 2017 to determine the success of the project completed in 2016. More recommissioning activities are set to begin in 2017 with the use of the real time circuit level metering systems described below.

Upcoming Actions:

- Real Time Circuit Level Energy Metering: operations staff are able to see how specific equipment and operations affect the energy use in the facility. This information will be easily accessible via computer and mobile devices as well as provide automated alarms and reporting capabilities. These systems are being funded through the Canada 150 infrastructure funding and will be installed at Mainway Recreation Centre, Tansley Woods Community Centre and Appleby Ice Centre.
- Power Factor Correction[2]: Currently staff are investigating power factor correction projects at a number of the city's large facilities. Correction of these losses will result in longer life of equipment as well as reduced utility bills.
- HVAC Upgrades: include heating, ventilation and cooling systems; an excellent way to decrease energy consumption as well as improve indoor air quality. Scheduled buildings include Tansley Woods Community Centre and

[2] Power Factor is a measure of how effectively power is being used in a facility. A high power factor signals efficient utilitzation of electrical power while a low power factor indicates poor utilization of electrical power. Because of the cost of wasted energy, electrical utilities usually charge a higher cost to industrial or commercial customers where there is a low power factor.

the Roads and Parks Maintenance Civic Operations Centre, Transit Headquarters as well as the Burlington Seniors Centre.

Vehicle Fleet Management

In 2008, city council endorsed the Green Fleet Transition Strategy. The strategy included a number of actions to improve efficiency and reduce emissions from the strategy, including right sizing vehicles, matching function requirements with vehicle size, target light duty vehicles with lower emissions, add hybrid vehicles to the fleet where it meets the needs; and implement smart driver education training, among other initiatives. In 2017, three plug-in hybrid vehicles will be added to the fleet.

Upcoming Actions:

The Green Fleet Transition Strategy is currently under review by staff to update the document and present to council later this year.

Streetlights & Traffic Signals

The City of Burlington completed the conversion of traffic signals from incandescent to LED fixtures in 2009. There have been some streetlight conversions to LED as roadways are reconstructed.

Upcoming Actions:

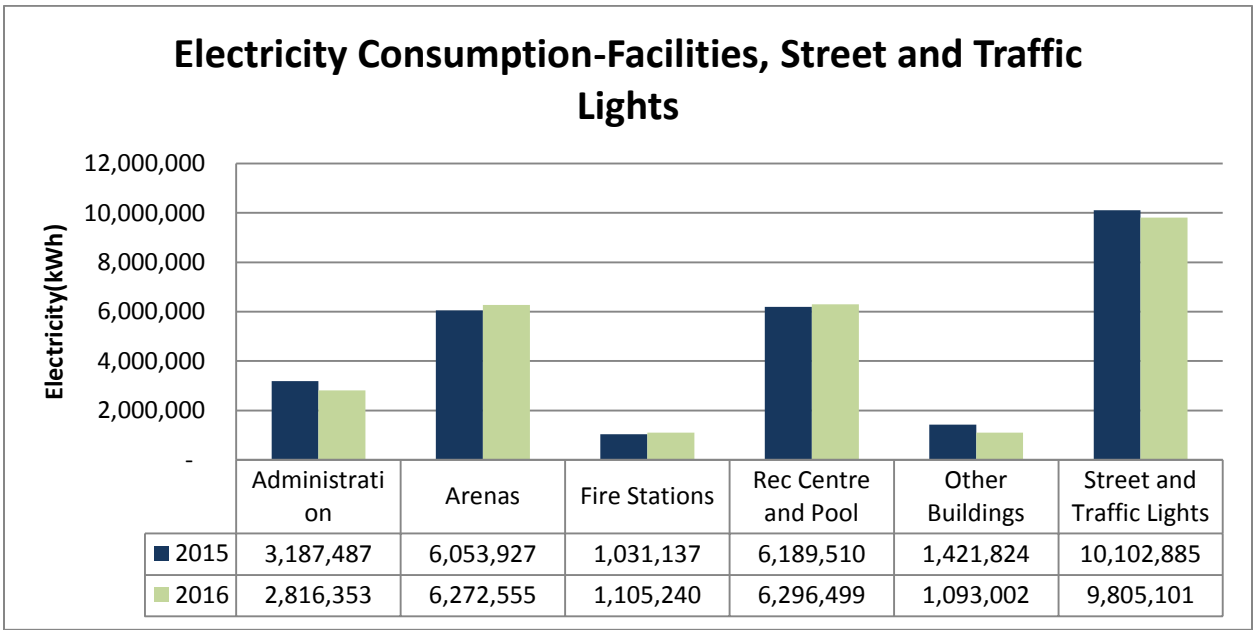
The city is currently working on a strategy to update the city's streetlights to LED fixtures to take advantage of provincial incentives.

3. Corporate Energy & Water Consumption

The following charts provide Burlington's 2016 utility use by building categories.

Electricity Consumption

The slight electricity consumption increase across most facilities can be attributed to the warmer weather in 2016 compared to 2015. The increase in the arenas area can be attributed to issues with refrigeration control systems which have now been repaired and systems are running as expected. The overall city electricity usage decreased in 2016 by approximately 598,020 kWh or 2.1% compared to 2015.

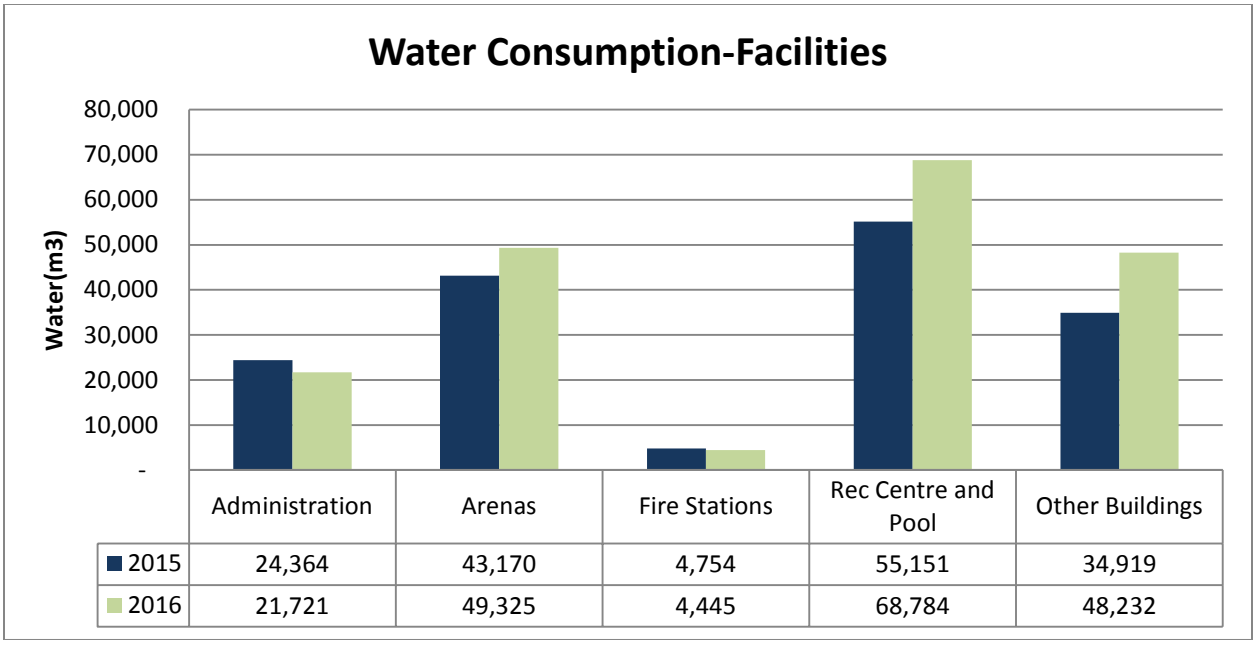


	Administration	Arenas	Fire Stations	Rec Centre and Pool	Other Buildings	Street and Traffic Lights
2015	3,187,487	6,053,927	1,031,137	6,189,510	1,421,824	10,102,885
2016	2,816,353	6,272,555	1,105,240	6,296,499	1,093,002	9,805,101

Note: this chart does not include parks and open spaces

Water Consumption

Overall city facility water consumption increased by approximately 30,418 m^3 or 18.6%. This increase can be attributed to additional irrigation systems, as well as higher use of irrigation systems and building expansions. The installation of splash pads with a 'once through' water system which reduces the amount of treatment required has also increase the amount of water used in the 'others' category by a significant margin. However, operating and maintenance costs for the splash pads are reduced as less treatment and energy is required.

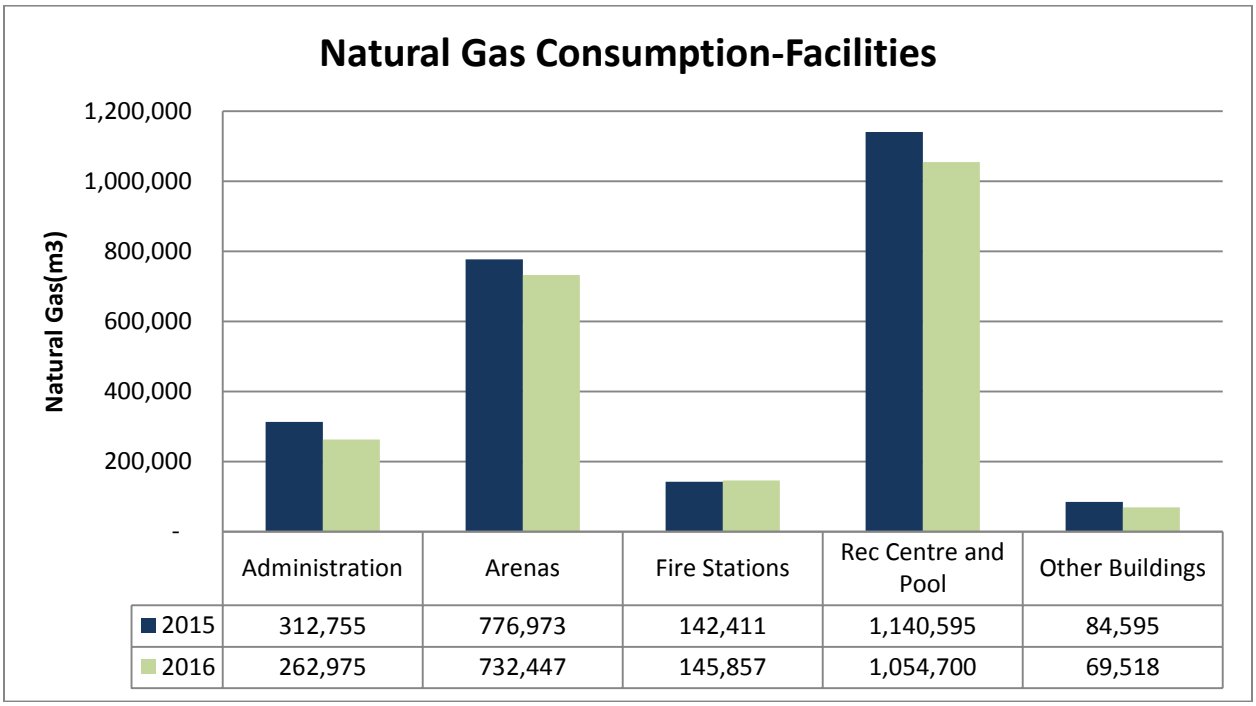


	Administration	Arenas	Fire Stations	Rec Centre and Pool	Other Buildings
2015	24,364	43,170	4,754	55,151	34,919
2016	21,721	49,325	4,445	68,784	48,232

Note: this chart does not include irrigation or parks and open space accounts.

Natural Gas Consumption

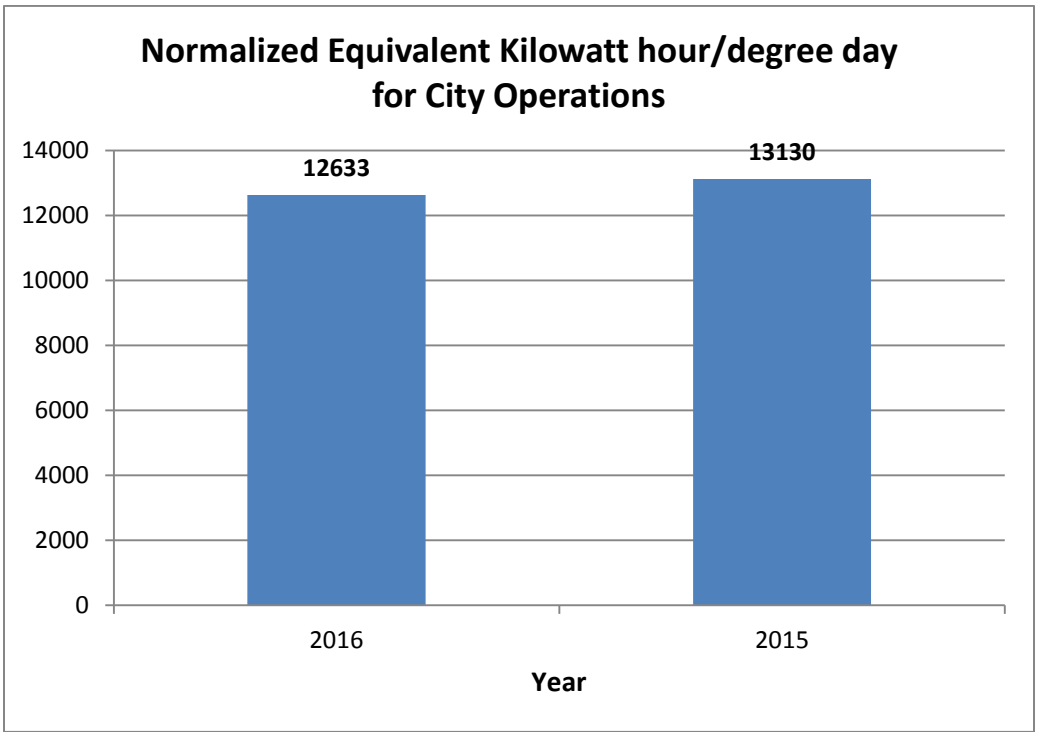
2016 was relatively warmer temperatures compared to 2015 (11% warmer or 436 fewer heating degree days - HDD), resulting in reduced overall city natural gas consumption by 7.8% or 191830 m^3 in savings.



	Administration	Arenas	Fire Stations	Rec Centre and Pool	Other Buildings
2015	312,755	776,973	142,411	1,140,595	84,595
2016	262,975	732,447	145,857	1,054,700	69,518

Overall Energy for City Operations – Normalized for Weather

Overall energy consumption for city operations when normalized for weather shows a 4% decline from 2015 to 2016.[3]



[3] Degree days are used to normalize energy data and take weather out of the equation. This is done by using the number of days above and below 18 degrees Celsius and dividing total energy by degree days to come up with equivalent kilowatt hours per degree day.

4. Corporate Greenhouse Gas Emissions

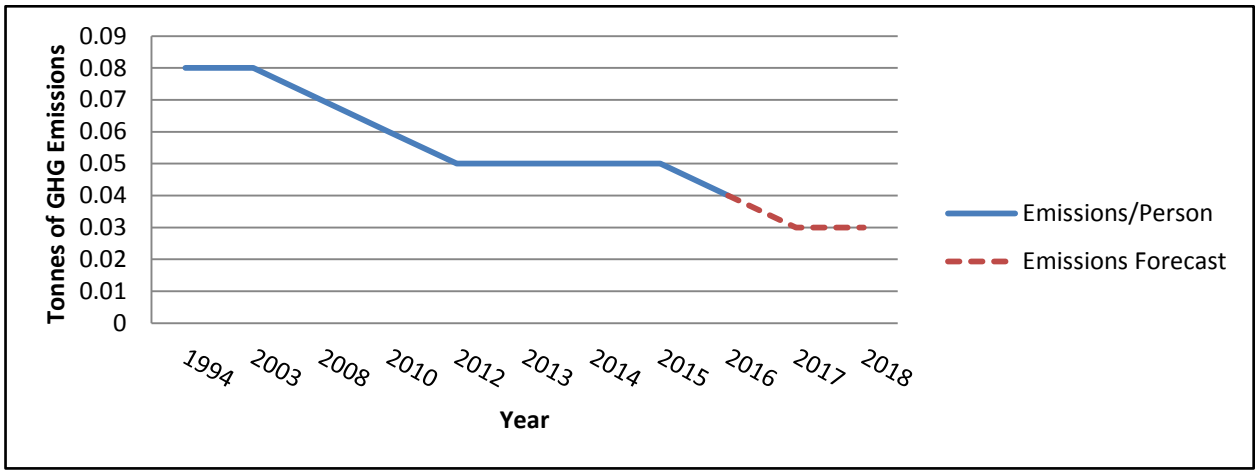
In 2007, city council endorsed the Strategic Plan, Future Focus Seven, with a corporate greenhouse gas emissions reduction target:

> Burlington will reduce corporate greenhouse gas emissions by 20 per cent on a per capita basis from 1994 levels by 2012

Corporate facility assets are a source of greenhouse gas emissions, directly and indirectly because of natural gas and electricity consumption. However, due to the phasing out of coal fired generation plants, greenhouse gas emissions from the electricity sector have been minimized at a provincial level. The city continues to implement energy conservation projects and investigates new and renewable technologies in order to mitigate greenhouse gas emissions.

The target equated to reducing emissions from 0.08 tonnes per capita to 0.06 tonnes per capita. Burlington reached its corporate emissions reduction target in 2010, largely due to the provincial government phasing out coal fired generating stations for electricity. As of 2016, emissions from city operations on a per capita basis was 0.04 tonnes.

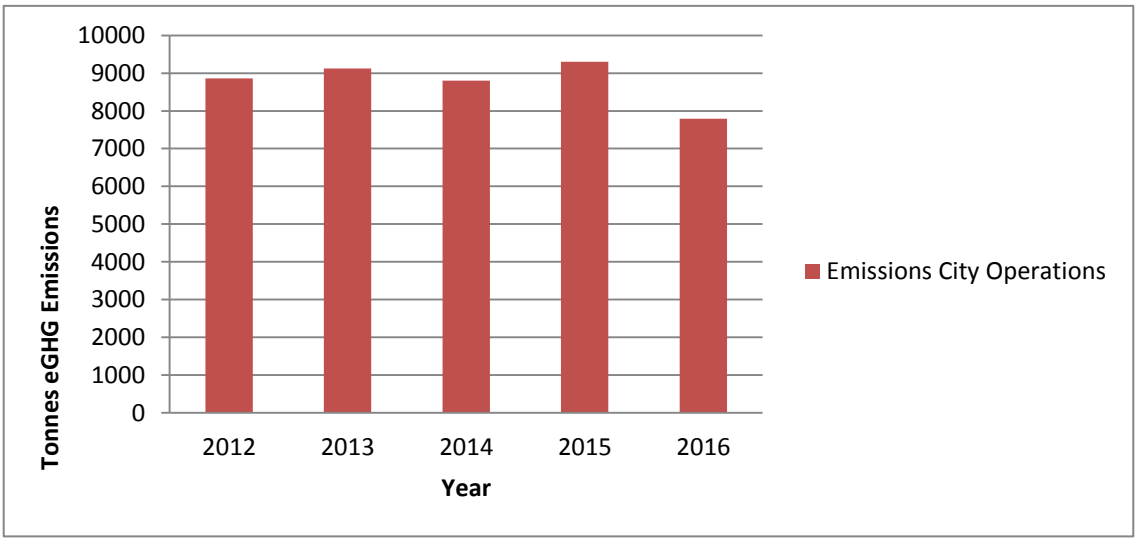
Greenhouse Gas Emissions from City Operations per Person (Tonnes)*



*Data excludes transit emissions

In 2016, greenhouse gas emissions from city operations decreased from 2015. Although electricity consumption increased from 2015, emissions from the provincial grid have decreased due to the types of generations (nuclear, hydro and renewables). The table below does not include emissions from transit, as under the Partners for Climate Protection Program, municipal transit systems are considered part of the community emissions profile.

Total Greenhouse Gas Emissions by City Operations (Tonnes)*

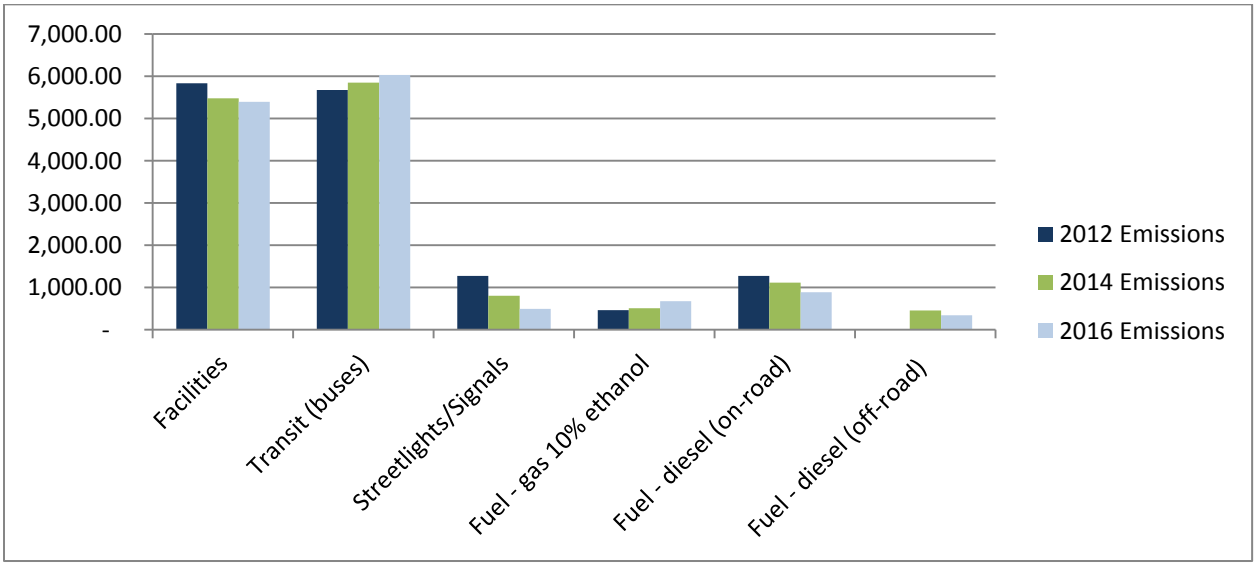


. *Excludes emissions from transit buses

The following chart breaks out greenhouse gas emissions by specific city operation from 2012 to 2016. For information purposes, transit has been included in the table below.

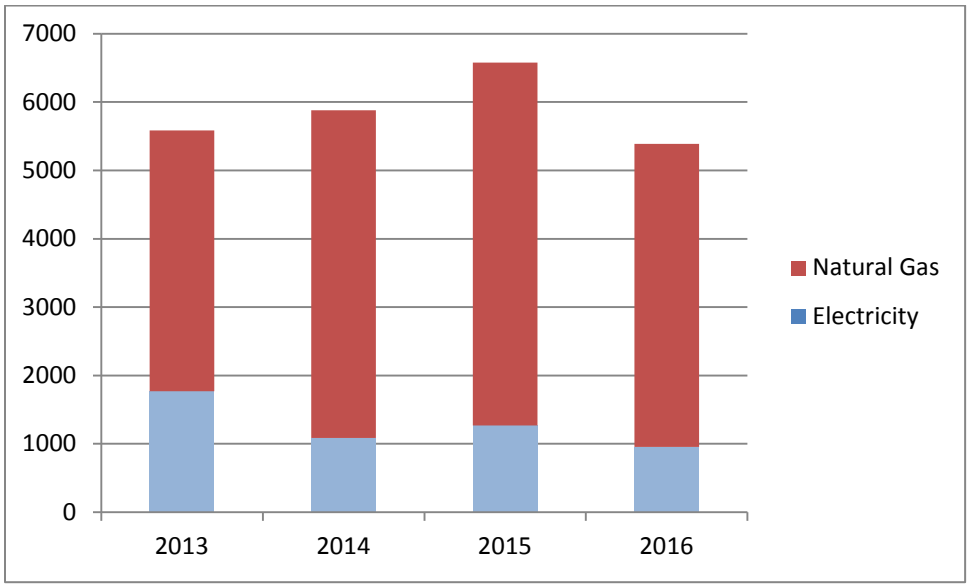
Emissions from transit buses and light duty vehicles have increased, whereas emissions from facilities, streetlights and signals, fleet vehicles using diesel, and off-road equipment have decreased.

Greenhouse Gas Emissions by City Operation (Tonnes)



The following chart shows greenhouse gas amounts by energy source (electricity and natural gas) for city facilities by year, illustrating the higher carbon footprint for natural gas (thermal energy).

Greenhouse Gas Emissions by Energy Source for Facilities (Tonnes)



5. Implementing the Community Energy Plan

In 2014, city council endorsed Burlington's first Community Energy Plan[4]. Community stakeholders engaged in the implementation of the Community Energy Plan include:

- Burlington Hydro
- Halton Region
- Union Gas
- Burlington Economic Development Corporation
- McMaster University
- Halton District School Board
- Halton Catholic District School Board
- BurlingtonGreen
- Burlington Sustainable Development Committee
- Joseph Brant Hospital
- Royal Botanical Gardens
- BOMA (Building Owners and Managers Association)
- Sustainable Hamilton Burlington

Vision

The following is the vision for the Community Energy Plan:

> To achieve a community that is efficient and economically viable in how it uses energy through new development and retrofits, land use and transportation planning, energy generation (including the use of renewables), conservation and industrial processes to reduce its reliance on the use of energy, reduce its carbon footprint, and improve local energy security.

Goals

There are five overall goals in the plan including:

1. Create leading edge community engagement in energy initiatives (conservation, generation and security) in order to enhance the implementation effectiveness and support sustained quality of life in Burlington.
2. Improve the energy efficiency of buildings in Burlington in ways that contribute to Burlington's overall economic competitiveness.
3. Increase sustainable local energy generation in Burlington and enhance supply security in ways that support Burlington's economic competitiveness.

[4] www.burlington.ca/CEP

4. Optimize integrated community energy systems and efficiency opportunities through land use planning.
5. Optimize integrated community energy systems and efficiency opportunities through land use planning.

Under each goal, there are corresponding objectives. In total, there are 55 actions in the plan.

5.1 Status of Community Energy Plan Actions

Details regarding the implementation are found in Chapter 5 of the plan. A table listing the 55 actions is provided, cross referenced by priority (high, medium and low), timing (near, medium, and long term), the lead agency, and resources required.

The Community Energy Plan is about the community; not just about city hall implementing actions for the community. The various stakeholders involved in the implementation of the plan are also responsible for implementing specific actions.

There are four task groups which meet to share progress on actions being implemented within the plan and identify synergies where stakeholders can work together to improve efficiencies. City Hall plays a coordinating role in the implementation of the plan.

The following are some highlights from the 2016 report.

Behaviour Change & a Culture of Conservation:

- Sustainability staff continues to use the Take Action Burlington blog (2 x month) to promote energy conservation, sustainable transportation options and electric vehicles, among other topics.
- There were two local events in 2016 to promote electric vehicles in Burlington; one by Burlington Hydro at their open house in October and the other at the summer car show. Plug'n Drive participated in both events and provided EVs for attendees to test drive. The 'electric alley' at the summer car show was a popular destination for visitors.
- Once again, the micro-turbine cogeneration plant was open to interested parties at Burlington Hydro's October open house.
- The Mayor hosted an Inspire Burlington event in November related to sustainable transportation featuring urban planner Brent Toderian and Jarrett Walker, transit expert.

- The Sustainable Development Committee hosted an event in November at Burlington Central Library for the public related to home energy alternatives, such as solar and heat pumps.
- 26 schools in Burlington are on the 'EcoSchool' certification track, where energy conservation is one of the key actions in the program. Two are on the Platinum certification track.

Energy Efficiency:

- Staff are monitoring progress in the interest of the province (Ministry of Environment and Climate Change) in working with municipalities to support programs where local improvement charges are used to support deep energy retrofits by residents and small businesses.
- The province has adopted legislation, the Energy Statute Law Amendment Act 2016, requiring building owners and managers of large private sector buildings to report on energy and water consumption beginning in 2018, similar to what the municipal sector is already required to do. Details are available in Ontario Regulation 20/17, Reporting of Energy Consumption and Water Use.
- The rebate provided to homeowners who participate in The Home Energy Rebate program administered by Union Gas has increased from $2,500 to $5,000.

Energy Generation & Security:

- The City of Burlington provided a council resolution for blanket support of rooftop solar installations in 2016 under the IESO's FIT (Feed-in Tariff) program.
- As of 2016, Burlington had an installed generating capacity of solar systems of 3.7 MW, with a forecast to increase this by another 2.3 MW by 2020, under both the FIT and MicroFIT programs.
- Phase 2 of the district energy feasibility study has been finalized showing that a small district energy system is technically feasible in Burlington. Staff are now assessing options for a business entity and financing to develop and implement a district energy system in Burlington.

Land Use & Growth:

- Burlington has launched a new draft Official Plan, Grow Bold, with policies to support intensification, sustainable design options, mixed use and live/work development, reduced sprawl and sustainable transportation options.
- Council approved resources to accelerate the planning for the three mobility hubs (Appleby, Burlington and Aldershot), supporting efficient higher density development with mixed residential/commercial uses, work/live opportunities and sustainable transportation options.
- The number of community gardens on city property continue to grow (4 in 2016) which support local food and community engagement, with a new one planned for 2017. The city was successful in obtaining a $20,000 grant from TD Friends of the Environment to support the installation of the next garden. Local food production emits less carbon than food that is transported long distances.

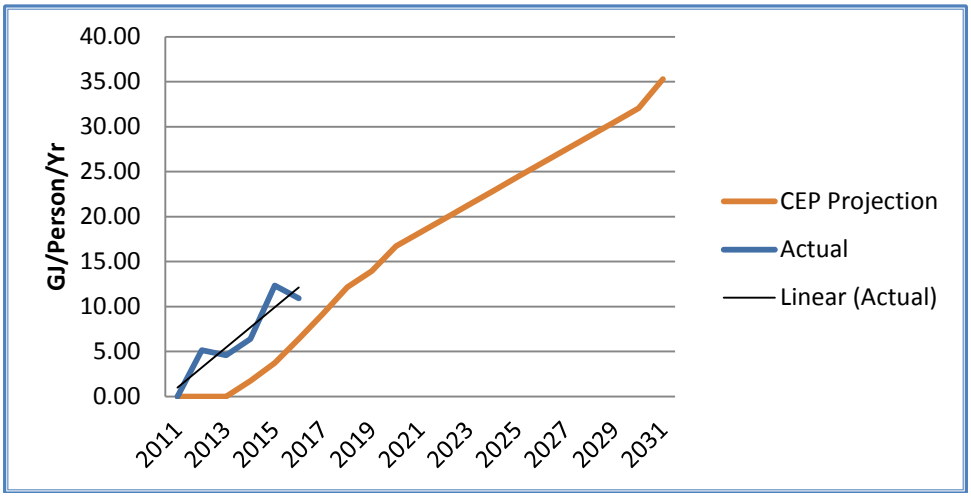
Transportation

- The city's Transportation Plan is currently underway which emphasizes the need to reprioritize and shift towards sustainable travel modes such as walking, cycling and public transit. GoBold is anticipated to be completed by Q1, 2018.
- Two car free street festivals took place in Wards 6 and 4/5 in 2016.
- The city supported initiatives to engage staff and the community such as Bike to Work day and Smart Commute Week.
- 30 schools participated in the Bike to School Week in 2016 (up from 5 in 2015) and were provided bike racks and signage for participating. The city has obtained funding to expand outreach in 2017, including cycle training.
- Burlington implemented a road diet pilot project on New Street, reducing road lanes from four to two, with bike lanes and a centre turning lane.

6. Community Energy Consumption

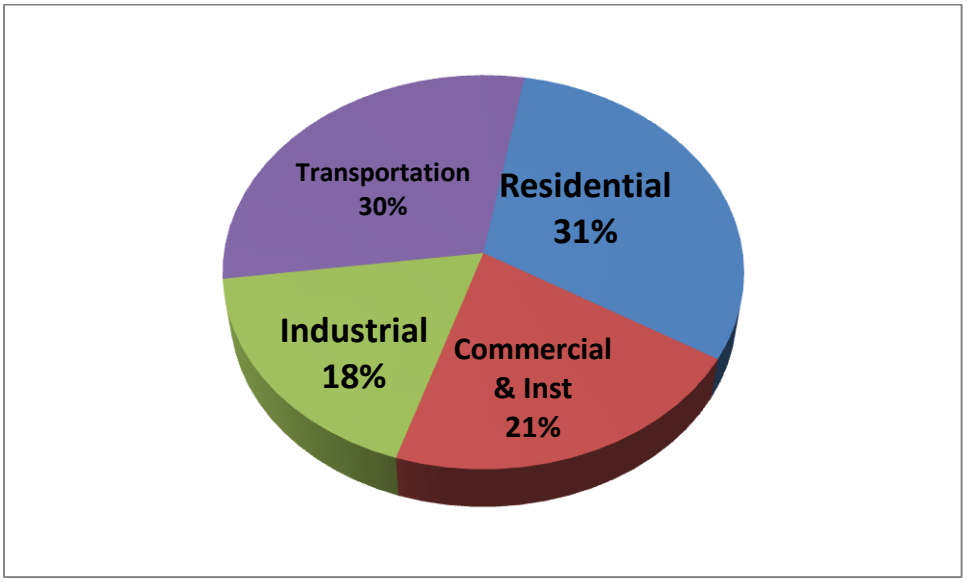
The following table shows total energy use reduction in the community on a per capita basis. The illustration of the data on a per capita basis accounts for growth in the community. The target in the 2014 Community Energy Plan is to reduce community energy consumption by 27% between 2014 and 2030. To date, community energy consumption has reduced by 10.9 gigajoules per capita, which represents approximately 31% of the overall reduction target of 35.5 gigajoules per capita. Overall, the community is ahead of its targeted reduction of 6.4 gigajoules per capita for 2016.

Total Energy Use Reduction Per Capita



The following table shows energy consumption by community sector. Note that the transportation sector represents 30% of energy consumption, whereas in Section 7 of this report, transportation represents 42% of our community greenhouse gas emissions.

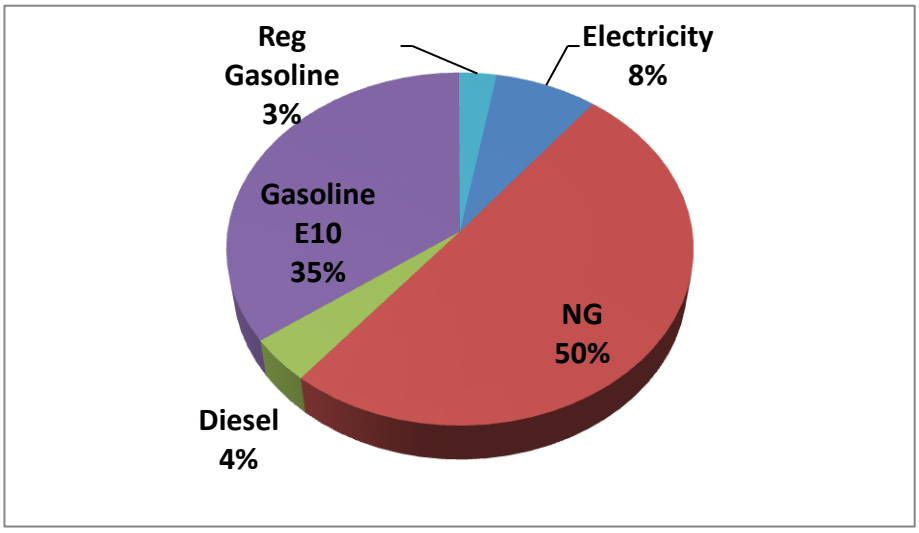
Community Energy by Sector – 2016



7. Community Greenhouse Gas Emissions

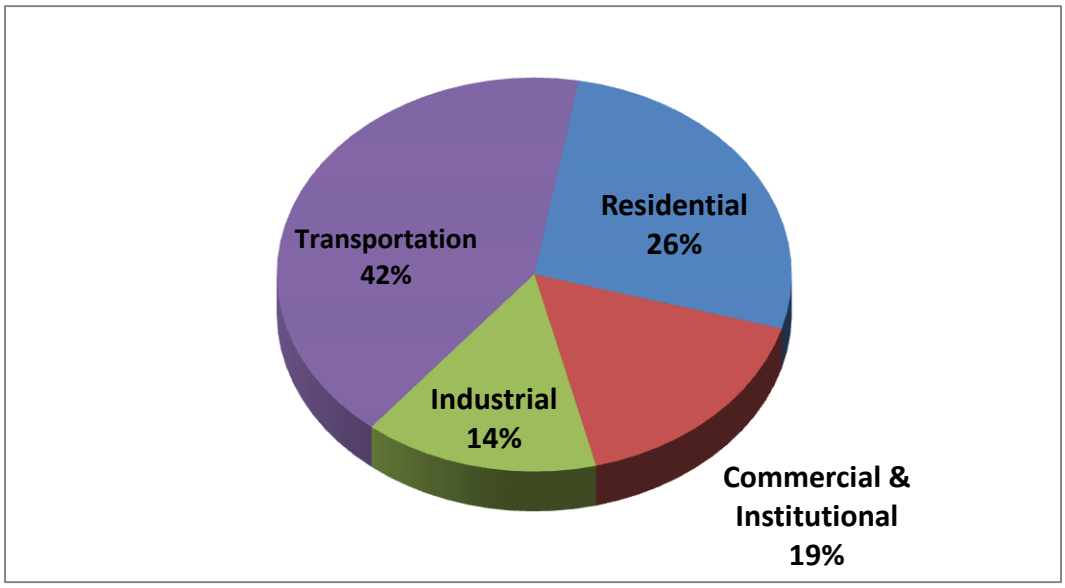
Natural gas (NG), generally consumed to produce thermal energy, represents just under half of emissions. Emissions in the electricity sector continue to decline as the province has phased out coal fired generating stations.

Community GHG Emissions by Source – 2016



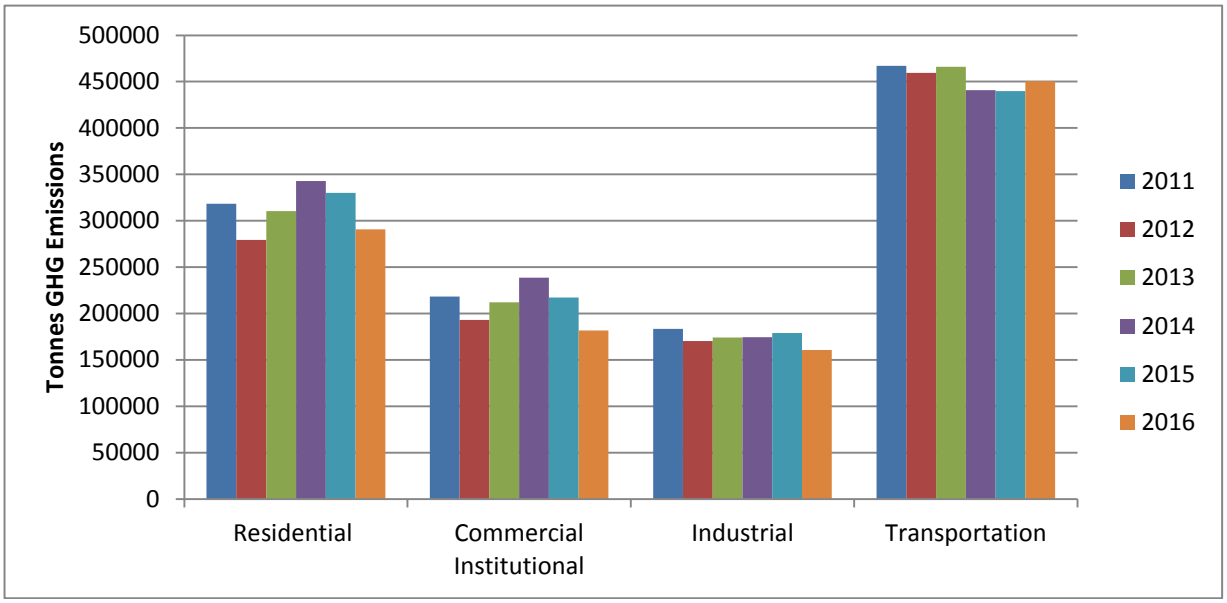
The breakdown of community emissions by sector has not changed significantly since 2011, with transportation representing 42% of the total.

Community GHG Emissions by Sector – 2016



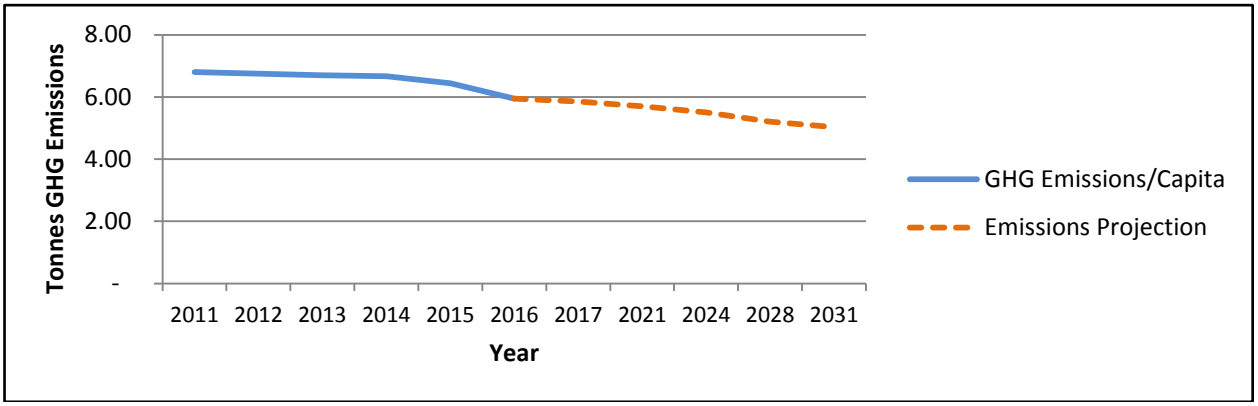
The next table shows that emissions are showing a decreasing trend for over the last three years for residential and ICI (industrial/commercial & institutional), with a slight increase the past year for transportation.

Community Greenhouse Gas Emissions by Sector - 2011 – 2014



This table shows a downward trend for greenhouse gas emissions on a per capita basis. The target in the Community Energy Plan is to reach 5 tonnes per capita by 2030.

Community Greenhouse Gas Emissions per Capita (Tonnes)



8. Next Steps

In 2015, city council approved a new Strategic Plan for Burlington with a 25 year timeline, a much longer time horizon than previous strategic plans.

A key strategic objective in the plan is for a healthier environment:

> Better environmental outcomes that will help to combat climate change, improve quality of life and economic competitiveness and foster civic pride.

A Healthy and Greener City is strategic direction #3:

> The City of Burlington is a leader in the stewardship of the environment while encouraging healthy lifestyles.

Three key actions in the plan are related to energy and climate change:

- The city's operations are net carbon neutral.
- The city will work with community stakeholders to implement the Community Energy Plan and achieve the goals and objectives related to energy conservation, generation and availability.
- The city recognizes that climate change is a significant issue and is working with the community and all levels of government towards the goal of the Burlington community being net carbon neutral.

The city's strategic plan includes a number of actions and initiatives which should help to reduce overall community emissions, particularly related to building a more complete and efficient community where specific areas such as the downtown, the mobility hubs and arterial corridors experience intensified development. A more intensified community will support sustainable transportation options, such as cycling, walking and transit. But transformational change will be required to achieve net carbon zero, particularly related to thermal energy and transportation.

The process to update the Community Energy and Corporate Energy Management Plans has begun and will include assessments of the implications of city operations being net carbon neutral by 2040 as well as the community transition to a net carbon zero community. Work completed by Dr. Jim Cotton with support from his students at the McMaster Institute for Energy will be incorporated into the Community Energy Plan.

Staff are also monitoring research by other external entities on how communities can reach net zero carbon goals.

APPENDIX A - Corporate Energy Management Plan Progress

EMP Action	Progress Update
Energy Management Information System – Installation and connection of interval meters to EMIS. - Investigate with LAS the technical options for integrating selected facility meters within the EMIS in order to allow real time utility data readings.	- The city recently received funding to install circuit level sub metering systems at three facilities. - The new Energy Management System that the city currently uses has the capability to include interval data, the systems above give much more detail and useful data than interval data on an entire facility.
Smart Buildings – integrate building systems to reduce energy consumption and improve efficiency. - Complete ice plant controls integration - Define integration specifications for new buildings or major retrofit projects	- New ice plant controls have been integrated to each of the city's arenas and continue to be monitored and improved. - Formal integration specifications have not been developed but new systems and technologies are being researched and implemented on case by case basis.
Monitoring and Targeting - to help control and reduce the energy use and improve operating procedures. - Develop framework for monitoring and targeting for buildings using the EMIS - Plan monitoring and targeting to assist with trouble shooting.	- Individual targets for Energy Use Index were developed as part of the Corporate Energy Management plan and are currently being tracked. - Those goals will be further defined with the circuit level metering systems that are being installed.
Energy Communications – launch energy awareness program - Continue to develop case studies for best practices using results obtained through utility analysis - Develop questionnaire to measure user awareness and satisfaction	- Case studies are continually developed as we complete projects. - More frequently scheduled meetings with different users are being scheduled to ensure that energy and sustainability are always taken into consideration.
Energy Training – for staff to understand the importance of using energy information to make informed decisions. - Develop an energy related training program to be implemented for operators, supervisor and managers.	- Energy training is continually being implemented through energy competitions between different facility staff as well as additional BAS training to improve the operators understanding of their systems and how energy is used within those systems.
Measurement and Verification – validates	- M&V actions are being taken into

EMP Action	Progress Update
actions taken to save energy and improve efficiency. - Develop monitoring and verification guidelines to be included in all projects that target energy savings.	consideration on every energy improvement project that is implemented. - Sometimes M&V is a requirement for incentives but we also record it where it isn't required for our own case studies.
Building System Documentation - Develop complete building operating manuals, using information provided by each department.	- As projects our completed, our electronic set of operating manuals and resources for each building continues to grow. Existing system documentation is added to these files as it becomes available.
Maintenance Management Software - Update AVANTIS maintenance management software with remaining corporate facility asset data. - Complete remaining preventative maintenance work order triggers	- A new maintenance management and work order system is currently being rolled out to different departments. - System will continually be updated with new system information and will have various different triggers for maintenance events.
Energy Star Portfolio Manager – an interactive energy management tool to track and assess energy and water consumption - Upload City Hall utility data as a pilot project and assess whether additional facilities should be completed.	- No update at this time.
Building Retrofit Actions – based on audits of 51 facilities - Schedule energy retrofit measures according to building priority and capital budget funding. - Coordinate annually with the corporate facility capital improvements funding.	- A long term capital plan for energy measures is currently being developed. - Coordination with corporate facility capital improvements happens on a regular basis to ensure that new projects include energy efficiency measures and best practices where possible.
Retro-commissioning – a systemic commissioning process to improve performance of building systems - Develop a corporate wide plan for retro commissioning for facilities that show increasing energy consumption over time.	- A corporate wide plan for retro commissioning has been developed and the first pilot project has now been completed. A priority list for the remainder of the city facilities has been developed and we will begin implementation in 2017.
New Construction – the city requires LEED silver for new buildings greater than 500 m2 or major retrofits	- The city still adheres to the LEED silver goal. - ASHRAE based standards will be

EMP Action	Progress Update
- Develop standard energy performance specifications based on ASHRAE 90.1 and ASHRAE 189.1 standards for new buildings	discussed by the corporate energy team.
Renewable Energy – helps to reduce greenhouse gas emissions. - Report on existing pilot projects - Investigate the economic feasibility of renewable projects	- With the implementation of cap and trade in Ontario as well as the city's carbon neutral operation goal, net metered solar projects as well as other renewables will become feasible. - Feasibility studies for these projects will be performed on a regular basis and if the business case can be supported they will be implemented.
On-site Generation and Demand Response - Investigate fuel switching to NG fuelled generators	- When generators are replaced, the most appropriate fuel is chosen for the site, this usually falls to NG. - Two of the cities arenas are currently enrolled in the IESO's demand response program.
Corporate Fleet – the city approved the Corporate Green Fleet Transition Strategy in 2008. - Complete fire fleet support vehicle replacement with new energy efficient vehicles by 2013 and update strategy	- Out of 16 support vehicles for the fire fleet, 10 are hybrid vehicles. - The green fleet strategy is currently being reviewed and updated. - Staff are reviewing options to add PHEV's to the city's fleet, such as parking enforcement.
Street Lighting and Traffic Signals - Complete inventory of streetlight assets - Complete update to streetlight design manual - Prepare business case including financing alternative for LED retrofit program	- The city is working on a strategy to update the city's streetlights to LED fixtures to take advantage of provincial incentives.
Corporate Energy Conservation Culture - Create an annual training program for building operators - Include building energy performance in the annual performance review for relevant staff - Design facility performance updates for general public and occupants.	- More detailed system training including energy management awareness is being developed and rolled out to the various operations staff groups. - Facility level reports and dashboards for supervisors and operators are currently being developed in the city's new Energy Management System.

APPENDIX B – Community Energy Plan Progress

Behaviour Change & a Culture of Conservation

Goal: Create leading edge community engagement in energy initiatives (conservation, generation and security) in order to enhance implementation effectiveness and support sustained quality of life in Burlington.

Objective A: Increase community engagement opportunities and uptake of energy programs.

Actions	Status (2016)
1. Create dedicated interactive community internet site on community energy.	The current webpage is at www.burlington.ca/cep; providing technical updates on the CEP.
2. Leverage available funding to promote conservation and demand management programs.	Both Burlington Hydro and Union Gas continue to deliver energy efficiency programs to businesses and residents through their CDM (Conservation Demand Management) and DSM (Demand Supply Management) plans.
3. Provide commercial, industrial and institutional facilities with energy assessments to identify conservation opportunities and behavioural-based programs that can reduce energy consumption. Help organizations rationalize longer term payback periods for energy projects.	Burlington Hydro (BHI) is actively promoting energy assessments for all interested commercial, industrial and institutional facilities. Uptake has exceeded over 50% facilities contacted by BHI. BHI has a Roving Energy Manager that is shared with Halton Hills Hydro and Milton Hydro Distribution Inc. BHI is also introducing a Small Business Lighting which will target 6,128 small businesses that have monthly electricity demand below 100 kW. Free assessments and retrofits (subject to limits) will be offered along with recommendations to improve lighting and other electrical operating efficiencies. Sustainable Hamilton Burlington also works with local businesses to help identify actions to improve energy efficiency.
4. Work with local partners to educate community on importance and opportunities for conservation, increasing awareness of energy and cost savings and GHG emission reductions. Provide comparisons of varying technologies, equipment and appliances, such as heat pumps verses gas furnaces and electric air conditioners.	BurlingtonGreen has implemented an Eco Score on their website for individuals and households to understand their impact on the environment, sponsored by Burlington Hydro. BurlingtonGreen hosted its annual Eco Fair in April where Burlington Hydro and the City/Sustainable Development Committee participated. Burlington Hydro hosted an open house in October where energy efficient information was available. The Sustainable Development Committee hosted the Alternative Sources of Energy for the Home event at Central Library in November with presentations on heat

Actions	Status (2016)
	pumps, geothermal and solar.
5. Implement an energy or climate change recognition program.	Existing programs include: the Mayor's Green Business Award through the Mayor's Office and Burlington Chamber of Commerce. IKEA was the most recent recipient. Staff also profile local companies and schools for their sustainability efforts, including energy conservation, in the TakeActionBurlington.ca blog. For example, Edge Imaging was profiled in 2016 for the work they have completed to improve the energy efficiency of their operations.
6. Use gamification, contests or reward programs to increase participation in conservation programs.	The Kids Corner link on Burlington Hydro's page has games for kids to play to learn about energy conservation. The Ministry of Energy's emPOWERme site also has a game to play related to matching the supply of energy from different sources to demand.
7. Participate in and promote province wide conservation programs such as Earth Hour.	The city continues to promote and participate in the annual Earth Hour event.
8. Use social media and media releases to promote upcoming events and conservation programs	The city and many of the stakeholders involved in the CEP use social media to promote conservation initiatives and events. The TakeActionBurlington blog is used by the city in this regard.
9. Increase community awareness of phantom power efficiency opportunities.	Phantom power occurs when electronics and appliances are turned off but still plugged in as they continue to draw power. Phantom power can be reduced by using power bars with timers. Information is available on Burlington Hydro's website.
10. Support school programs to engage community on conservation initiatives.	Halton District School Board bought 30 Kill a Watt monitors to use as part of their education component in their classrooms. Halton Catholic District School Board is working with both Union Gas and Burlington Hydro on real time reporting at each school. Once that's up and running, they plan to implement incentive programs. Sustainability staff on occasion makes presentations on request to schools, including information on the importance of energy conservation and reducing greenhouse gas emissions. 26 schools in Burlington are currently on the EcoSchool certification track, with two targeting platinum certification.
11. Work with community partners to	The city is an active member of the Halton Smart

Actions	Status (2016)
engage community on sustainable transportation options, such as transit, carpooling, cycling and walking.	Commute program, promoting sustainable transportation options and participating in special events such as Bike to Work Day; and Car Free Sunday. The Burlington Transit Youth Ambassadors group promotes transit to youth. BFAST, a local community group, is also involved in promoting and advocating for local transit. Thirty schools participated in the Bike to School Week in 2016, up from 5 the in 2015. Schools were provided with bike racks and signage for participating. The city has obtained funding to expand outreach in 2017, including cycle training.

Energy Efficiency

Goal: Improve the energy efficiency of buildings, in ways that contribute to Burlington's overall economic competitiveness.

Objective A: Improve energy efficiency of existing building stock.

Actions	Status (2016)
1. Target conservation programs to older residential building stock, with future consideration for the industrial, commercial and institutional sector, as identified in the energy mapping exercise.	Burlington Hydro is actively promoting energy assessments for all interested commercial, industrial and institutional facilities. Marketing of programs is currently being directed at those facilities which have historically demonstrated the greatest need and opportunity for conservation in combination with the potential to achieve the greatest amount of conservation cost effectively. Union Gas offers programs such as the Home Reno Rebate and one targeted to Low Income Housing.
2. Consider incentives or financing programs, such as using Local Improvement Charges, to assist residents to finance retrofits.	Toronto's HELP (Home Energy Loan Program) continues to be monitored. The province is looking to work with municipalities to implement a province wide program for homeowners. A municipal task group may be set up through the Clean Air Council to provide guidance to the province. Burlington will participate if the opportunity is offered.
3. Provide every commercial, industrial and institutional building with an energy assessment to identify opportunities for energy use, water and waste reduction opportunities, and provide financial assistance through Union Gas and Burlington Hydro Conservation and Demand Management	Burlington Hydro is actively promoting energy assessments for all interested commercial, industrial and institutional facilities. Uptake has exceeded over 50% of facilities contacted by BHI.

Actions	Status (2016)
Programs.	
4. Lobby provincial government to extend conservation programs by five years or greater, and federal government to reinstate residential energy efficiency programs.	Conservation programs have been extended to 2020 through Burlington Hydro's CDM (conservation demand management) and Union Gas' DSM (demand supply management) plans approved by the Ontario Energy Board.
5. Encourage building owners/managers to benchmark energy usage of buildings and develop or use an existing database, such as Portfolio Manager, for tracking community building energy data and create competition.	The province has adopted legislation, the Energy Statute Law Amendment Act 2016, requiring building owners and managers of large private sector buildings to report on energy and water consumption beginning in 2018, similar to what municipalities are already required to do. Details are available in Ont. Reg. 20/17, Reporting of Energy Consumption and Water Use.
6. Encourage building owners/managers to consider 3rd party energy efficiency programs such as LEED™ programs for existing buildings or BOMA BESt.	BOMA is active with its members to promote their BOMA BESt program. The implementation of a Sustainable Building and Development Guideline in the city should assist this action (part of Phase 2 of the Official Plan review).
7. Encourage businesses and residents to improve the thermal energy efficiency of their buildings and homes through measures such as increased insulation and weather stripping.	Burlington Hydro, through its facility energy assessments is recommending upgrades to building envelope thermal efficiency. The Home Reno Rebate administered by Union Gas has increased from $2,500 to $5,000 to improve energy efficiency.
8. Investigate the impact of switching residential heating/cooling systems from natural gas furnace and electric air conditioners to heat pump technologies.	Burlington Hydro has developed an assessment tool that can be used to evaluate the economic implications between the use of heat pump technologies and fossil fuel technologies.

Objective B: Encourage builders to exceed Ontario Building Code requirements for energy efficiency in new buildings.

Actions	Status (2016)
1. Encourage builders to improve energy efficiency and sustainability of new buildings beyond the Ontario Building Code, utilizing third party programs such as LEED™ certification, BOMA BESt, or ENERGY STAR® for new homes.	The draft Sustainable Building and Development Guideline has been posted to the city's website for public comment until the end of June. The Sustainable Development Committee continues to be active in promoting green building measures and commenting on key development applications.
2. Ensure that all new commercial, industrial and institutional	Burlington Hydro and Union Gas are promoting the High Efficiency New Construction program to all new

Actions	Status (2016)
buildings, including major renovations, are evaluated for energy and water efficiency improvements, and waste reduction opportunities, and provided with implementation incentives through Union Gas' and Burlington Hydro's High Performance New Construction Programs.	projects in the City of Burlington.

Objective C: Decrease energy consumption through efficiencies in appliances and electrical equipment.

Actions	Status (2016)
1. Increase participation rates in programs like the Great Refrigerator Round-up which enables residents to part with their inefficient second refrigerator.	The Great Refrigerator Round-up program has been discontinued, primarily due to its success in removing excess refrigerators. Appliances can still be picked up by Halton Region.
2. Educate people on the benefits of the ENERGY STAR® program, particularly when purchasing new appliances and electronics and the impact of phantom loads.	Use of Energy Star appliances and electronics are being encouraged by Burlington Hydro, the IESO and Natural Resources Canada.
3. Collaborate with other municipalities and interested organizations to lobby manufacturers, distributors and senior levels of government to improve efficiency standards of electronics to reduce phantom power.	Burlington Hydro has entered into a collaborative Conservation and Demand Management delivery program with Milton Hydro Distribution and Halton Hills Hydro. This program will reduce delivery costs and ensure that programs are delivered cost efficiently.

Energy Generation & Security

Goal: Increase sustainable local energy generation in Burlington and enhance supply security, in ways that support Burlington's economic competitiveness.

Objective A: Increase capacity for integrated community energy utility infrastructure.

Actions	Status (2016)
1. Improve the reliability of the electricity distribution grid through smart grid technologies to support community energy projects, allow greater green power generation interconnections and enhance economic growth through highly reliable power.	Burlington Hydro has developed a Risk Management Plan and Operations Plan for 2018 which addresses numerous improvements to system reliability. The northeast quadrant of Burlington continues to have restrictions imposed by Hydro One for renewable energy connections.
2. Complete feasibility study for district energy in the downtown core.	Phase 2 of the feasibility study has been finalized showing that a small district energy system is technically feasible in Burlington. Staff are now assessing options for a business entity and financing to develop and implement a district energy system in Burlington.
3. Complete long term plan for district energy systems in other locations, such as the Aldershot Mobility Hub and QEW employment corridor.	An assessment of the Official Plan policies was completed for the mobility hubs to ensure that they are not a barrier to implementing district energy in these areas.
4. Consider feasibility of alternative technologies to support integrated community energy systems such as storage.	Burlington Hydro, through its affiliate, Burlington Electricity Services Inc., has installed a portable natural gas micro turbine cogeneration plant at its head office in Burlington as a demonstration project. The unit produces 90 kW of electricity and sufficient heat for much of the building.

Objective B: Develop a long term renewable energy strategy for Burlington.

Actions	Status (2016)
1. Identify and mitigate distribution system constraints, particularly related to renewable energy generation.	Burlington Hydro has developed a Risk Management Plan and Operations Plan for 2018 which addresses numerous improvements to system constraints. The northeast quadrant of Burlington continues to have restrictions imposed by Hydro One for renewable energy connections.
2. Provide consumer support to access incentive programs for renewable energy.	Burlington Hydro actively assists all consumers who express an interest in renewable energy programs and grid interconnections. The City of Burlington provided a council resolution for blanket support of rooftop solar installations in 2016 under the FIT program.

3. Work with local community groups to support community energy, such as solar, geothermal and storage installations.	Burlington Hydro, through its participation in the Community Energy plan regularly informs the community stakeholders on issues regarding renewable energy. Burlington Hydro will connect any renewable energy project to its distribution grid, provided there is sufficient ground fault protection on the feeders and transformer stations.
4. Explore net metering as an opportunity to support renewable energy projects in the absence of a FIT (feed-in tariff) contract where connections to the grid are technically allowable.	A net metering option is available through Burlington Hydro, but is rarely utilized in the presence of FIT programs. The Microturbine cogeneration plant that Burlington operates is net metered. Net metering was chosen due to a very insignificant quantity of electricity exported to the grid.

Objective C: Enhance reliability of energy grid to ensure energy security.

Actions	Status (2016)
1. Ongoing investment in technologies such as automated switching and self-healing grids.	Burlington Hydro has developed a Risk Management Plan and Operations Plan for 2018 which addresses numerous improvements to system reliability. .

Land Use & Growth

Goal: Optimize integrated community energy systems and efficiency opportunities through land use planning.

Objective: Ensure land use policies and plans enhance energy efficient and integrated community energy system (including renewable) linkages between land use, buildings and transportation.

Actions	Status (2016)
1. Ensure principles to support a healthy and *complete community* are included in the Official Plan.	These principles and reflected in the new Strategic Plan and have been strengthened in the new (draft) Official Plan.
2. Where compatible, encourage compact, efficient mixed-use neighbourhoods that optimize infill, redevelopment and densification strategies that integrate residential, office and retail commercial developments.	Specific objectives and actions are included in the new Strategic Plan related to intensification and mixed use neighbourhoods. The draft Official Plan includes policies related to mixed use intensification areas, comprising urban centres, mobility hubs and mixed use nodes, designed and oriented to support and facilitate transit and active transportation.
3. Emphasis on mixed use, higher density development in downtown core, mobility hubs, and along intensification and prosperity corridors that support future district	See above. An assessment of city policies was completed as part of the district energy feasibility study to ensure support for future district energy systems.

Actions	Status (2016)
energy options.	
4. Provide Official Plan policies to support future connections to district energy systems.	Draft policies have been incorporated into the new Official Plan to support future development of district energy systems.
5. Assess neighbourhoods to determine the ease of mobility for pedestrians and cyclists and access to convenient public transit.	The new Strategic Plan includes actions related to the adoption of a walkability score tool to assist with planning decisions in Burlington and targeting a gold standard as a Bicycle Friendly Community. The city was recently recognized at the silver level.
6. Use modeling tools to evaluate the energy impacts of large developments and provide recommendations for improvements	This is an issue that the Sustainable Development Committee is interested in pursuing. The City of Toronto has had experience in this area. One area to consider is to limit the amount of energy that can be 'delivered' to a new building to force energy efficiency measures.
7. Support BEDC's strategy to revitalize older employment areas through redevelopment by encouraging updated efficiency standards and ensuring access by sustainable transportation options.	The Burlington Innovation District (BID) study and forum was completed in 2015 and provided key insights needed for identifying and developing a vision for employment land intensification in Burlington. The broad series of visioning workshops completed in support of the city's Strategic Plan resulted in recommendations to be considered through the Official Plan review process.
8. Enhance capacity of municipal staff to consider passive energy and sustainable building measures to conserve energy through the planning approvals process where feasible.	Still to be completed. However, consideration of passive house and carbon neutral requirements were included in the Request for Proposals for the new pavilion to be built in City View Park.
9. Encourage local food production and farm markets.	Burlington has four community gardens as of 2016 and was recently the recipient of a $20,000 grant from TD Friends of the Environment to develop a new garden in Ireland Park. Local groups such as BurlingtonGreen and the Halton Food Council also deliver programs that support local food. Halton Region distributes a map illustrating where people can find local food. The Lions Club continues to run the seasonal farmers market at Burlington Mall. A local business in downtown Burlington also offers a farmers market on Sundays on a seasonal basis.

Transportation

Goal: Increase transportation efficiency.

Objective A: Improve modal split – increase number of people using more sustainable transportation options such as transit, carpooling, walking & cycling.

Actions	Status (2016)
1. Support BEDC's employment strategy to boost local work opportunities for residents and reduce outbound commuting.	In line with the new City of Burlington Strategic Plan BEDC is opening an Innovation Centre to help companies start and grow locally. In addition BEDC in coordination with Burlington Transit formed an Employer Transit Advisory to help identify barriers and solutions to encourage employees to commute to work via public transit.
2. Promote Halton Smart Commute (travel demand management) program to increase number of participants in Burlington.	The city continues to participate in the Halton Smart Commute program as a member and promote the program within the community through its participation in events such as Car Pool Week, Bike to Work Day and Smart Commute Week. Smartcommute.ca/halton
3. Emphasize the importance of sustainable transportation measures, such as transit and active transportation, in the City's Transportation Master Plan (TMP).	The city's Transportation Plan is currently underway which emphasizes the need to reprioritize and shift towards sustainable travel modes such as walking, cycling and public transit. GoBold is anticipated to be completed by Q1, 2018.
4. Assess cycling infrastructure network in Burlington to identify gaps for improvement through the TMP.	The City is currently preparing a terms of reference and anticipates initiating the Cycling Master Plan Update Study in Summer of 2018. The update to the CMP will focus on identifying a minimum grid of safe and convenient cycling infrastructure and will provide guidance with respect to the type of infrastructure needed to achieve an increase in cycling mode share.
5. Consider feasibility of car share and bike share programs.	The new Strategic Plan includes actions related to this issue, such as future development in higher density areas will consider car-share and bike share options. Car share vehicles are available at limited locations in Burlington, such as the Burlington GO Station (2 zip cars) and a Community Car Share vehicle at 730-760 Brant Street. A Community Car Share vehicle is being considered for the downtown core where the city could utilize it through a corporate membership and be available to the public after hours.
6. Support/encourage school oriented programs to increase active transportation initiatives.	The city has teamed with other Halton municipalities to work collaboratively to promote, deliver and sustain the Active and Sustainable School Travel (ASST) initiative across the region. Current initiatives include School Travel Planning and the development of a multi-modal school travel plan for Alton Village Public School.

Actions	Status (2016)
	30 schools participated in the Bike to School Week in 2016 (up from 5 in 2015) and were provided bike racks and signage for participating. The city has obtained funding to expand outreach in 2017, including cycle training. The city supported International Walk to School Day in October and Winter Walk Day in February (part of the Healthy Kids Community Challenge).

Objective B: Increase fuel efficient vehicles & reduce emissions.

Actions	Status (2016)
1. Monitor electric vehicle market and investigate the feasibility of electric charging stations at City facilities, including downtown parking lots.	The city installed its first EV charging station in the parking garage and expansion is being planned. Burlington Hydro offers a program to lease EV charging stations to residents.
2. Promote low and zero emissions vehicles.	Local stakeholders continue to promote EVs to residents, including the Sustainable Development Committee, Burlington Hydro and the organizers of the annual car show. The 'electric vehicle alley' at the 2016 car show in downtown Burlington particularly attracted significant attention, with participation by Plug'n Drive, the Golden Horseshoe Electric Vehicle Association and BurlingtonGreen.
3. Encourage adoption of sustainable fleet measures by private and institutional organizations, using local examples to encourage change.	The city has had a number of hybrid vehicles in its light duty fleet over several years, including one heavy duty aerial hybrid truck. Three plug-in hybrid EV vehicles will be added to the city's fleet of vehicles in 2017 to show community leadership. Burlington Hydro has two full EVs that they share with their stakeholders and partners to experience the benefits of driving an EV. Union Gas is also promoting the benefits of incorporating natural gas heavy duty vehicles (transit buses) into fleets as a lower carbon option than diesel.

Objective C: Support sustainable transportation infrastructure.

Actions	Status (2016)
1. Ensure new and reconstructed arterial and collector roads are built as complete streets that are safe and accessible for pedestrians and cyclists of all ages where feasible.	There is an objective in the new draft Official Plan to establish a complete streets strategy in the city. A pilot project is underway on New Street in Burlington where it was reduced from four lanes to two lanes with bike lanes and a middle turning lane.
2. Ensure new development is transit friendly.	The new Strategic Plan includes the following target: Future development in key mixed nodes will be higher density, walkable, accessible and well-serviced by

Actions	Status (2016)
	public transportation. There are a number of 'transit friendly' objectives and policies in the new Official Plan.
3. Seek opportunity through the Transportation Master Plan study to improve the City's transportation network and overall connectivity for all modes of transportation, to reduce frequency and duration of automobile trips.	The city's Transportation Plan is currently underway which emphasizes the need to reprioritize and shift towards sustainable travel modes such as walking, cycling and public transit. GoBold is anticipated to be completed by Q1, 2018.
4. Ensure linkages and coordination between City's transportation planning initiatives and regional initiatives (e.g. Halton Region and Metrolinx – the Big Move).	The new Strategic Plan includes the following action: The city will work with Metrolinx, Halton Region and the province to find multi-modal, flexible and affordable solutions to accommodate the projected traffic generation from growing employment lands.